User Manual

Connection to INTERBUS Siemens S7
Functions, Interface 02, 10, 23

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
This symbol is used to refer to instructions which, if ignored or not carefully followed, will result in death or serious injury.

WARNING
This symbol is used to refer to instructions which, if ignored or not carefully followed, could result in death or serious injury.

CAUTION
This symbol is used to refer to instructions which, if ignored or not carefully followed, could result in minor or moderate injury.

NOTICE
This symbol and the accompanying text alerts the reader to a situation which may cause damage or malfunction to the device, either hardware or software, or surrounding property.

Reference to source of information
This symbol refers to detailed sources of information on the current topic.

1.2 Safety Notes

- Read this manual carefully before using the software. Keep this manual in a place where it is always accessible to all users.
- The user manual, in particular the safety notes, must be observed by all personnel working with the software and the programmed device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The software has to be used for programming operating devices exclusively. Every other use is not permitted.

1.4 Target Group

All configuration and programming work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

2 INTERBUS Siemens S7 Functions, Interface 02, 10, 23

The INTERBUS Siemens S7 Functions protocol allows a communication between a operating device and an OPC INTERBUS interface. The operating device is connected to the INTERBUS using an optical fiber cable.

The serial register extension SRE is used for communication. This makes it possible to exchange 8 bytes of user data through the INTERBUS.

2.1 PCP Structure

The PCP structure comprises 10 bytes.

Table 2-1 PCP structure with 8 inputs and 8 outputs

Byte	Content
1	PCP code
2	PCP
3	PCP
4	PCP
5	PCP
6	PCP
7	PCP
8	PCP
9	Optional inputs _.8 to _.15
10	Inputs _.0 to _.7 or outputs _.0 to _.7

2.1.1 ID Code

The operating device uses ID code 241 to identify itself to the INTERBUS as a 4-word PCP participant.

2.1.2 Process Data

The operating device identifies itself to the INTERBUS with 16 bit process data located in byte 9 and 10.

2.2 Data Types

Use the following data types for a direct access. Values marked by xxx depend on the configuration of the controller.

Table 2-2 Data types for INTERBUS Siemens S7 Functions

Data Type	Mnemonic	From	Up to		From	Up to	Access Authorization
Counter	Z	0	xxx				View only
Timer	T	0	xxx				View only
Input	E	0.0	xxx.7				
	EB	0	xxx				
	EW	0	xxx				
	ED	0	xxx				
Output	A	0.0	xxx.7				
	AB	0	xxx				
	AW	0	xxx				
	AD	0	xxx				
Flag	M	0.0	xxx.7				
	MB	0	xxx				
	MW	0	xxx				
	MD	0	xxx				
Peripheral Input	PEB	0	xxx				
	PEW	0	xxx				
	PED	0	xxx				
Peripheral Output	PAB	0	xxx				
	PAW	0	xxx				
	PAD	0	xxx				
Data Blocks	DB	1	255	DBX	0.0	8191.7	
				DBB	0	8191	
				DBW	0	8190	
				DBD	0	8188	

2.3 Programming

2.3.1 Protocol Parameters

You can use the protocol parameters to influence the communication between the operating device and the bus node. All parameters are set to the default values which ensure a reliable communication.

2.3.1.1 Baud Rate

This parameter specifies the communication rate.

Table 2-3 Baud rate

Configurable Values (Baud)	Default Value
300	
600	
1200	
2400	
4800	
9600	
19200	
38400	X
57600	
76800	
115200	

2.3.1.2 Parity

This parameter specifies the parity used to control the communication.

Table 2-4 Parity

Configurable Values	Default Value
None	X
Even	
Odd	

2.3.1.3 Handshake

This parameter specifies the method used to control the communication.

Table 2-5 Handshake

Configurable values	Default Value
No Handshake	X
Hardware	
Software	

2.3.1.4 Data Bits

This parameter specifies the number of data bits.

Table 2-6 Data bits

Configurable Values	Default Value
5	
6	
7	
8	X

2.3.1.5 Stop Bits

This parameter specifies the number of stop bits.

Table 2-7 Stop bits

Configurable Values	Default Value
1	X
1.5	
2	

2.3.1.6 Timeout for Response

This parameter specifies how long the operating device waits for a response from the PLC.

Table 2-8 MMICOM handshake timeout

Configurable Values	Default Value
0 ms to 65535 ms	1000 ms

The timeout period for response must clearly exceed the cycle time of the controller. The bus node waits for one quarter of the defined timeout period before starting a repeat transmission. This repeat transmission is executed no more than twice, after which the operating device returns a communication error. If the timeout period defined is 1000 ms, the first repeat transmission is sent after 250 ms and the second repeat transmission after a total of 500 ms. The communication error is issued if the controller does not reply within approximately 750 ms in total.

2.3.1.7 Delay until Connection Set-Up

This parameter specifies the waiting time after which the operating device starts the communication.

Table 2-9 Delay until connection set-up

Configurable Values	Default Value
0 s to 20 s	2 s

2.3.2 Input Syntax

The following image illustrates the structure of the input syntax for variables in the programming software.

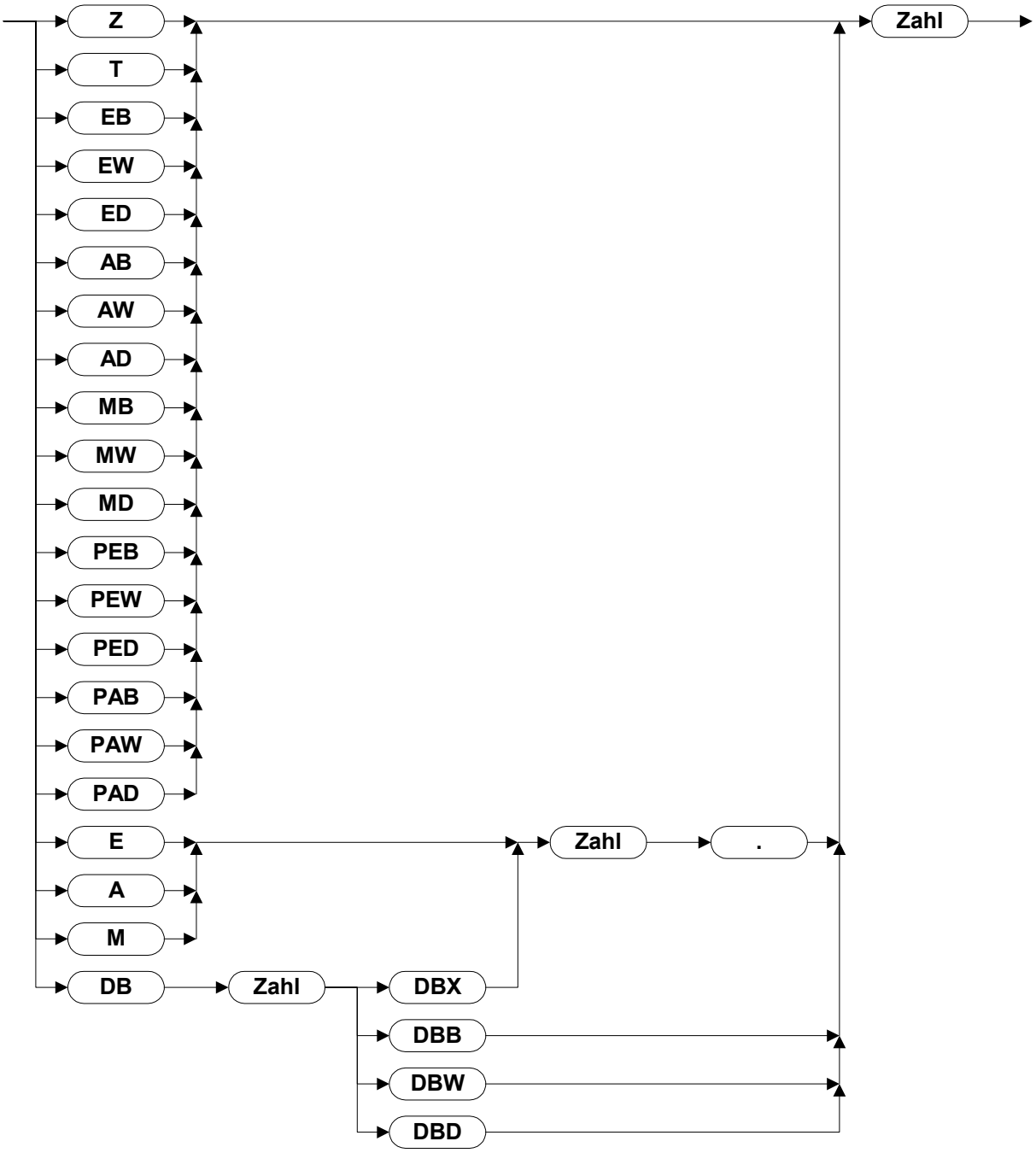


Figure 2-1 Syntax diagram

2.4 Physical Connection

Use the RS232 interface to connect an operating device to the bus node BK06.

2.4.1 Pin Assignment for Operating Devices with an Universal Interface

Table 2-10 Pin assignment RS232

Pin	Designation	Function
6	TD	Transmitted Data
15	CTS	Clear to send
17	RTS	Request to send
18	RD	Received data
25	SGND	Signal Ground

2.4.2 Pin assignment for operating devices without a universal interface

Table 2-11 Pin assignment RS232

Pin	Designation	Function
1	nc	Not Connected
2	RD	Received Data
3	TD	Transmitted Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

2.4.3 Pin Assignment for Bus Nodes

Table 2-12 Pin assignment RS232

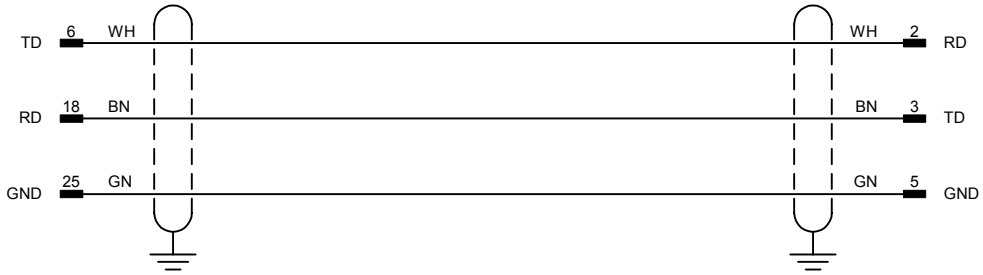
Pin	Designation	Function
1	nc	Not Connected
2	RD	Received Data
3	TD	Transmitted Data
4	nc	Not Connected
5	GND	Ground
6	nc	Not Connected
7	nc	Not Connected
8	nc	Not Connected
9	nc	Not Connected

2.4.4 Cable SER1 RS232 - Bus Node BK06

The following cabling diagram applies to operating devices with an universal interface **only**.

Operating Device

Bus Node



D-SUB
Male Connector
25 Pin

D-SUB
Male Connector
9 Pin

2.5 Error Messages

Error messages are displayed on the operating device along with a code and sub-code. Error messages are composed as follows:

Communication Error

Code XXXXX

Subcode XXXXX

Retries XXXXX

Table 2-13 Error messages for INTERBUS Siemens S7 Functions

Code	Subcode	Error Type	Possible Cause
4		Timeout error	
	XXXX	Address of the data requested last	
50		Error when initializing bus node	
	100	BUS_AKTIV (bus_active), but no response from S7 yet	
	101	BUS_NICHT_AKTIV (bus_not_active)	
54		No response to information report within configured time	
	100	BUS_AKTIV (bus_active), but no response from S7 yet	
	101	BUS_NICHT_AKTIV (bus_not_active)	
	102	DATA_ABORT_S7	
59		Wrong packet number received	
	XXXX	The received packet number	
62		Wrong micro controller program version	
	XXXX	Program version of the Micro controller	
64		Wrong number of data received	
	XXXX	Number of data received	
67		Illegal packet length	
	XXXX	Requested packet length	
70		Error sending a request	
	0x0B	NAK during disconnect	
	0x0C	NAK during disconnect	
	0x15	QVZ (acknowledgment delay) on connection setup	
	0x17	NAK during disconnect	
	0x19	Both partners have high priority	
71		Error receiving a request	
	0x03	Hardware error	

Table 2-13 Error messages for INTERBUS Siemens S7 Functions

Code	Subcode	Error Type	Possible Cause
	0x0F	Receive box blocked	
	0x13	No further repetition	
	0x15	Block delay	
	0x17	Wrong BCC	
72		Initialization response has wrong length	
	XXXX	The received length	
Logical error from decoding function FC78			
150		Specified source data block cannot be opened	
	XXXX	DB number	
151		Specified target data block cannot be opened	
	XXXX	DB number	
152		Unknown area for bit data	
	XXXX	Start byte	
153		Unknown area for receiving byte data	
	XXXX	Start byte	
154		Data block to be written to with bit data does not exist	
	XXXX	DB number	
155		Data block to be written to with byte data does not exist	
	XXXX	DB number	
156		Data block from which transmission data are to be read does not exist	
	XXXX	DB number	
157		Unknown area for transmit byte data	
	XXXX	Area number	
158		Wrong number of data block for range data	
	XXXX	DB number	
159		Wrong length for range data block	
	XXXX	Start byte	

Table 2-13 Error messages for INTERBUS Siemens S7 Functions

Code	Subcode	Error Type	Possible Cause
160		Range exceeded for periphery bit data	The size of the addressed range for received data exceeds the available range.
	XXXX	Start address of range to be written to	
161		Range exceeded for input bit data	
	XXXX	Start address of range to be written to	
162		Range exceeded for output bit data	
	XXXX	Start address of range to be written to	
163		Range exceeded for flag bit data	
	XXXX	Start address of range to be written to	
164		Range exceeded for data block bit data	
	XXXX	Start address of range to be written to	
170		Range exceeded for peripheral byte data	
	XXXX	Start address of range to be written to	
171		Range exceeded for input byte data	
	XXXX	Start address of range to be written to	
172		Range exceeded for output byte data	
	XXXX	Start address of range to be written to	
173		Range exceeded for flag byte data	
	XXXX	Start address of range to be written to	
174		Range exceeded for data block byte data	
	XXXX	Start address of range to be written to	
175		Range exceeded for counter word data	
	XXXX	Start address of range to be written to	
176		Range exceeded for timer word data	
	XXXX	Start address of range to be written to	

Table 2-13 Error messages for INTERBUS Siemens S7 Functions

Code	Subcode	Error Type	Possible Cause
180		Range exceeded for periphery byte data	The size of the addressed range for transmission data exceeds the available range.
	XXXX	Start address of requested range	
181		Range exceeded for input byte data	
	XXXX	Start address of requested range	
182		Range exceeded for output byte data	
	XXXX	Start address of requested range	
183		Range exceeded for flag byte data	
	XXXX	Start address of requested range	
184		Range exceeded for data block byte data	
	XXXX	Start address of requested range	
185		Range exceeded for counter word data	
	XXXX	Start address of requested range	
186		Range exceeded for timer word data	
	XXXX	Start address of requested range	

2.6 Applications

2.6.1 Siemens S7-400

2.6.1.1 OB1

First of all, OB1 calls the FC12 once with Mode 10 (Handshake enable).

In OB1, the function block FB171 is called once for all operating devices within the INTERBUS segment. In FB171, the function block FB71 is then called once for each operating device.

FB71 uses the function codes

– FC19 (displays FC12 in Mode 20 and only information reports are transferred)
– FC78 (for decoding the information reports received)
– FC18 (for returning the requested data via Compact PCP)

At the end of OB1, FC14 is called once with Mode 10 (Handshake disable).

Communication takes place as follows.

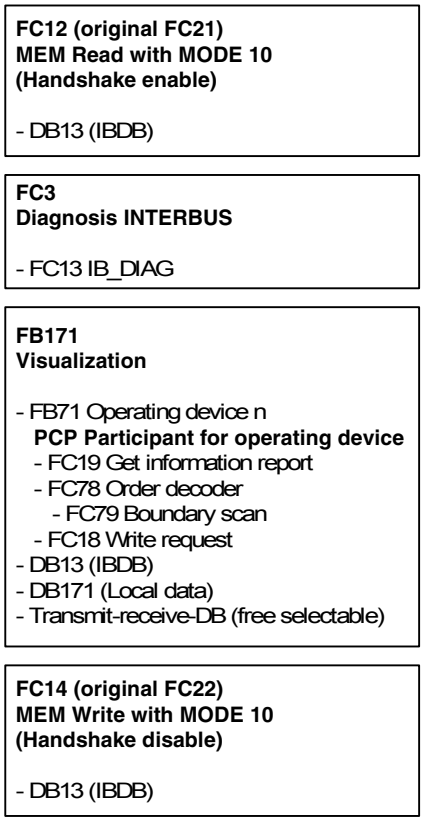


Figure 2-2 Structure of the OB1 when using a bus node

If you are installing several operating devices within the INTERBUS segment, you must call FB71 once for each of these operating devices.

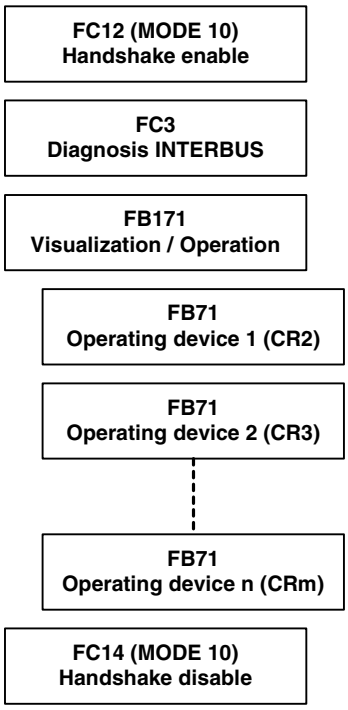


Figure 2-3 Structure of the OB1 for multiple operating devices with bus node

Each PCP participant has its own communication reference (CR).

There is a risk that information report telegrams may be lost if the handshake operation is executed twice during an OB1 cycle.

2.6.1.2 OB100 and OB101

The functions FC8 and FC11 are called up in OB100 and OB101.

The function blocks must be called in the following order:

1. FC8
2. FC11

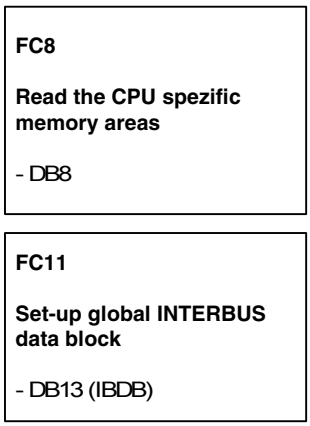


Figure 2-4 Structure of OB100 and OB101

2.6.1.3 Function Block FB71

In function block FB171, enter a call instruction for function block FB71 for every operating device. Function block FB71 manages the requests from the operating device received through PCP.

Function FC78 decodes the requests from the operating device.

Function FC79 carries out the range check on the requests.

The areas for the transmission data and received data are located in the variable list of function block FB71. Both areas have a fixed length.

– Area for received area = 68 bytes
– Area for transmission data = 58 bytes

Always specify the instance data block of the calling function block as data block for the received data and the transmission data.

Call instruction:

```
CALL  #Pult_1
```

Table 2-14 FB71 parameters

Parameter	Value	Description
InstDB	#InstDB	Number of instance data block for FB171
IBS_ParamDB	13	Number of INTERBUS parameter data block
CommRef	2	Communication reference of operating device
Source_DB	#InstDB	Instance data block for information report
Source_Offset	80	Offset in instance data block for information report
Dest_DB	#InstDB	Instance data block for transmission data
Dest_Offset	148	Offset in instance data block for transmission data
InitZyk	MB1	Request for new connection setup
DatenCpuDb	8	Number of data block for range data
DatenCpuDbOffset	248	Offset in data block for range data
IBSRunStopBit	M13.0	Bus malfunction when changing from 1 to 0. InitZyk is set when changing from 0 to 1.
TimerSim	M0.5	Flag bit for timer simulator must correspond to hardware configuration of the Simatic Manager (cycle time/clock flag)
Maskenanwahl	MW4444	Mask number for mask switching

Table 2-15 FB71 variable declaration

Address	Declaration	Name	Type	Starting Value	Comment
0.0	in	InstDB	INT	0	
2.0	in	IBS_ParamDB	INT	0	
4.0	in	CommRef	INT	0	
0.6	in	SourceDB	INT	0	

Table 2-15 FB71 variable declaration

Address	Declaration	Name	Type	Starting Value	Comment
8.0	in	Source_Offset	INT	0	
10.0	in	Dest_DB	INT	0	
12.0	in	Dest_Offset	INT	0	
14.0	in	InitZyk	BYTE	B#16#0	
16.0	in	DatenCpuDb	INT	0	
18.0	in	DatenCpuDbOffset	INT	0	
20.0	in	IBSRunStopBit	BOOL	FALSE	
20.1	in	TimerSim	BOOL	FALSE	
	out				
22.0	in_out	Maskenanwahl	INT	0	Mask number for mask selection
24.0	stat	Daten1	ARRAY[1..48]	B#16#0	
*1.0	stat		BYTE		
72.0	stat	toggle_vari	STRUCT		
+0.0	stat	RetInit	BOOL	FALSE	
+0.1	stat	BusyInit	BOOL	FALSE	
+0.2	stat	RetGetInf	BOOL	FALSE	
+0.3	stat	RetBusyInf	BOOL	FALSE	
+0.4	stat	RetWriteReq	BOOL	FALSE	
+0.5	stat	RetBusyWrite	BOOL	FALSE	
+0.6	stat	dummy1	BOOL	FALSE	
+0.7	stat	dummy2	BOOL	FALSE	
+1.0	stat	FC78Reset	BOOL	FALSE	
+1.1	stat	FC78dummy	BOOL	FALSE	
+1.2	stat	FC78dummy1	BOOL	FALSE	
+1.3	stat	FC78dummy2	BOOL	FALSE	
+1.4	stat	FC78dummy3	BOOL	FALSE	
+1.5	stat	FC12FlankeRead	BOOL	FALSE	
+1.6	stat	ConfOK	BOOL	FALSE	
+1.7	stat	FC78WriteData	BOOL	FALSE	
=2.0	stat		END_STRUCT		
74.0	stat	internStatFC180	INT	0	
76.0	stat	Zaehler	WORD	W#16#0	
78.0	stat	PackKenn	BYTE	B#16#0	
80.0	stat	Daten0	WORD	W#16#0	PCP service ID

Table 2-15 FB71 variable declaration

Address	Declara-tion	Name	Type	Starting Value	Comment
82.0	stat	Dat1	WORD	W#16#0	Number of parameter words
84.0	stat	Dat2	WORD	W#16#0	Communication reference
86.0	stat	Dat3	WORD	W#16#0	Packet ID/Index
88.0	stat	Dat4	WORD	W#16#0	Subindex always 0 / byte length of user data
90.0	stat	Dat5	WORD	W#16#0	MPI address - ID/type
92.0	stat	Dat6	WORD	W#16#0	MPI address - number
94.0	stat	Dat7	WORD	W#16#0	MPI address - partial area (for DB only)
96.0	stat	data0	WORD	W#16#0	MPI address - area / high byte byte address
98.0	stat	data1	WORD	W#16#0	MPI address - 13-bit byte address 3-bit
100.0	stat	data2	WORD	W#16#0	User data for sending data from DW20 to DW66 (48 bytes of user data)
102.0	stat	data3	WORD	W#16#0	
104.0	stat	data4	WORD	W#16#0	
106.0	stat	data5	WORD	W#16#0	
108.0	stat	data6	WORD	W#16#0	
110.0	stat	data7	WORD	W#16#0	
112.0	stat	data8	WORD	W#16#0	
114.0	stat	data9	WORD	W#16#0	
116.0	stat	data10	WORD	W#16#0	
118.0	stat	data11	WORD	W#16#0	
120.0	stat	data12	WORD	W#16#0	
122.0	stat	data13	WORD	W#16#0	
124.0	stat	data14	WORD	W#16#0	
126.0	stat	data15	WORD	W#16#0	
128.0	stat	data16	WORD	W#16#0	
130.0	stat	data17	WORD	W#16#0	
132.0	stat	data18	WORD	W#16#0	
134.0	stat	data19	WORD	W#16#0	
136.0	stat	data20	WORD	W#16#0	
138.0	stat	data21	WORD	W#16#0	
140.0	stat	data22	WORD	W#16#0	

Table 2-15 FB71 variable declaration

Address	Declara-tion	Name	Type	Starting Value	Comment
142.0	stat	data23	WORD	W#16#0	
144.0	stat	data24	WORD	W#16#0	
146.0	stat	data25	WORD	W#16#0	End of received user data
148.0	stat	data26	WORD	W#16#0	Write service ID
150.0	stat	data27	WORD	W#16#0	Number of parameter words
152.0	stat	data28	WORD	W#16#0	Communication reference
154.0	stat	Data29	WORD	W#16#0	Packet ID/Index
156.0	stat	Data30	WORD	W#16#0	Number/subindex
158.0	stat	Data31	WORD	W#16#0	User data or 1 byte error code + high byte error code
160.0	stat	Data32	WORD	W#16#0	User data or low byte error subcode
162.0	stat	data33	WORD	W#16#0	Only user data up to DW124
164.0	stat	datum1	WORD	W#16#0	
166.0	stat	Datum2	WORD	W#16#0	
168.0	stat	Datum3	WORD	W#16#0	
170.0	stat	Datum4	WORD	W#16#0	
172.0	stat	Datum5	WORD	W#16#0	
174.0	stat	Datum6	WORD	W#16#0	
176.0	stat	Datum7	WORD	W#16#0	
178.0	stat	Datum8	WORD	W#16#0	
180.0	stat	Datum9	WORD	W#16#0	
182.0	stat	Datum10	WORD	W#16#0	
184.0	stat	Datum11	WORD	W#16#0	
186.0	stat	Datum12	WORD	W#16#0	
188.0	stat	Datum13	WORD	W#16#0	
190.0	stat	Datum14	WORD	W#16#0	
192.0	stat	Datum15	WORD	W#16#0	
194.0	stat	Datum16	WORD	W#16#0	
196.0	stat	Datum17	WORD	W#16#0	
198.0	stat	Datum18	WORD	W#16#0	
200.0	stat	Datum19	WORD	W#16#0	
202.0	stat	Datum20	WORD	W#16#0	

Table 2-15 FB71 variable declaration

Address	Declaration	Name	Type	Starting Value	Comment
204.0	stat	Datum21	WORD	W#16#0	End of transmission user data
206.0	stat	Pollb_Reserve	BYTE	B#16#0	Poll area for operating device (reserve)
207.0	stat	Pollb_Koordinier	BYTE	B#16#0	Poll area for operating device (coordination byte)
208.0	stat	Pollb_Meldekanal	WORD	W#16#0	Poll area for operating device (serial message channel)
210.0	stat	Abbild_Maskennum	INT	0	Current mask number of operating device
212.0	stat	Uhr_Jahr	BYTE	B#16#0	Set real-time clock in operating device
213.0	stat	Uhr_Monat	BYTE	B#16#0	Set real-time clock in operating device
214.0	stat	Uhr_Tag	BYTE	B#16#0	Set real-time clock in operating device
215.0	stat	Uhr_Stunde	BYTE	B#16#0	Set real-time clock in operating device
216.0	stat	Uhr_Minute	BYTE	B#16#0	Set real-time clock in operating device
217.0	stat	Uhr_Sekunde	BYTE	B#16#0	Set real-time clock in operating device
218.0	stat	Uhr_Sync_Trigger	BOOL	FALSE	Auxiliary bit for clock synchronization
218.1	stat	BusBreak	BOOL	FALSE	

2.6.1.4 Function Block FB171

In function block FB171, function block FB71 is called separately for each operating device and the parameters for each individual operating device are transferred.

In the variable declaration table for FB171, you must enter the FB71 for each operating device. It must be entered as a multiple instance in the static area of the column "Type.

The following example for a declaration table contains three entries for operating devices. In the column "Type", the entry "FB71" is automatically replaced by the entry "SuetronPanel".

Call instruction: `CALL FB171, DB171`

Table 2-16 Variable declaration for FB171

Address	Declara-tion	Name	Type	Starting Value	Comment
0.0	stat	BereichsDaten	ARRAY[1..7]		
*2.0	stat		WORD		
14.0	stat	Pult_1	"SuetronPanel"		1st operating device
234.0	stat	Pult_2	"SuetronPanel"		2nd operating device
454.0	stat	Pult_3	"SuetronPanel"		3rd operating device

In the variable “BereichsDaten” with a field size of 7 words, function FC78 saves the starting address and quantity of data requested by the operating device. This information is used to execute a range check. The field is also used as a buffer.

You can declare 62 multiple instance entries of the FB71 type (SuetronPanel) consecutively without gaps.

You must NOT alter the declaration table structure until after the multiple instance entries!

2.6.1.5 Function FC3

The function FC3 calls the Phoenix Contact function FC13 IB_DIAG to determine the bus status.

If the bus is started again following an error, function FC3 registers the new status of the INTERBUS. The function block FB71 then initiates a new connection setup.

Call instruction: `CALL „IB_Diagnose`

The function FC3 has no parameters.

2.6.1.6 Function FC8

The function FC8 calls up the system function SFC51 “RDSYSST” to determine the CPU-specific memory areas. These are stored in DB8 starting from data word 240. The data are now available for the range check.

Call instruction: `Call „ReadAKZ“`

The function FC8 has no parameters.

2.6.1.7 Function FC11 „INIT_IB“

The function FC11 initializes the INTERBUS data block IBDB with the required data. The timer T1 is used in this function.

The function FC11 is called once in the start-up organization blocks OB100 and OB101.

Call instruction `Call FC 11`

Table 2-17 Parameters for the function FC11

Parameter	Value	Description
IN_IBDB	13	Number of the global INTERBUS data block. The function FC11 parameterizes the IBDB
IN_COM_ADR	1276	S7 base address of the controller board Must be located above the peripheral address 1000.
IN_DIAG_STATE	1048	S7 address of the diagnostic status register
IN_DIAG_PARA	1050	S7 address of the diagnostic parameter register
IN_FKN_START	1054	S7 address of the standard function start register
IN_FKN_PARA	1056	S7 address of the standard function parameter register
IN_FKN_STATE	1058	S7 address of the standard function status register
IN_MEM_READ	12	Block number of the FC MEM_READ
IN_MEM_WRITE	14	Block number of the FC MEM_WRITE
IN_LOAD	0	Configuration of the controller board 0 = Load configuration from parameterization memory (from Flash card)1 = Load configuration through function blocks of the application (IB_ADRSS)2 = Load configuration through a CMD file and data blocks
IN_BOOT	0	Bus system start 0 = Start from the configuration 1 = Start with the configuration frame 1 from the application (the number of the configuration frame to be activated and to be started is transferred with the parameter "BOOT")
IN_MODE	0	Operating mode of the controller board (standard = 0)0 = A_SYN (asynchronous mode)1 = IB_SYN (synchronous mode - INTERBUS-controlled)2 = A_SYN (asynchronous) with synchronization pulse as an interrupt
IN_TIMER_NR	T1	Number of a timer used by FC11
IN_SOURCE	0	Number of the parameterization data block for IN_LOAD = 2.

Table 2-17 Parameters for the function FC11

Parameter	Value	Description
IN_CONFIGURATION	DW#16#0	Bit0 = 0 = The FC IB_DIAG enters PF entries into the IBDB Bit0 = 1 = The FC IB_DIAG does not enter PF entriesBit1 = 0 = The FC IB_DIAG enters USER entries into the IBDB Bit1 = 1 = The FC IB_DIAG does not enter USER entriesBit2 = 0 = The FC IB_DIAG enters BUS entries into the IBDB Bit2 = 1 = The FC IB_DIAG does not enter BUS entriesBit3 = 0 = The FC IB_DIAG enters CTRL entries into the IBDB Bit3 = 1 = The FC IB_DIAG does not enter CTRL entriesBit4 = 0 = No data consistency for input and output data (FC21/22 mode 0-9)Bit4 = 1 = Data consistency for input and output data (FC21/22 mode 0-9)Bit31 = 0 = S7-400 DSC in direct mode of operation (S5-ADAPTOR)Bit31 = 1 = S7-400 DSC in extended mode of operation - Only the address entries of the parameter COM_ADR are required - all other addresses are preset. In COM_ADR, you specify the base address of the "FM451 FIX SPEED" entered during parameterization of the S7 hardware.
OUT_RET	#FC11Ret	Result bit - If the result bit is set, the DBW56 of the IBDB contains an error code with the following meaning:1 = Timeout2 = Negative result for "Stop and request new configuration" 3 = Negative result for "Start data transfer" 4 = Parameter LOAD not valid 5 = Communication register not addressable (may be wrong base address, HWdefect)6 = Error in parameterization sequence (in SOURCE parameter)— DBW76 of the IBDB contains the displayed diagnostics status register — DBW78 of the IBDB contains the displayed diagnostics parameter register— DBW74 of the IBDB contains the service code with the error; it is used for internal purposes.
INOUT_BUSY	#FC11Busy	Function active - is set by the user as an edge bit. This bit must be set during call-up.

2.6.1.8 Function FC12 „MEM_READ“

The function FC12 activates the handshake between the controller board and the connected operating devices.

The function FC12 is called once when entering the OB1 cycle with mode 10.

The bit #FC12BusyBit must already be set when the function is called up. Otherwise no action will be taken.

To set the bit #FC12BusyBit:

```
UN #FC12BusyBitS #FC12BusyBit
```

Call instruction

```
Call FC 12
```

Table 2-18 Parameters for the function FC12

Parameter	Value	Description
IN_IBDB	13	Number of the global INTERBUS data block.
IN_MODE	10	Operating mode of the controller board; here always the value 10
IN_SOURCE	0	Number of the parameterization data block.
IN_DEST_AREA	0	Data destination area
IN_DEST_AREA_NR	0	Number of the data block if the destination area = data.
IN_DEST_OFFSET	0	Start address in data destination area
IN_DEST_LENGTH	0	Number of words to be read
OUT_RET	#FC12RetBit	Result bit - If the bit is set, the DBW58 of the IBDB contains an error code with the following meaning:1 = "DB0" has been specified as the destination in DEST_AREA_NR 2 = Invalid parameter specified in DEST_AREA 3 = Invalid operating mode specified in MODE 4 = Invalid CR number specified in SOURCE (number of an PCP-enabled INTERBUS partici-pant)5 = A data set that has not been activated in IBS CMD has been specified
INOUT_BUSY	#FC12Busy Bit	Function active - is set by the user as an edge bit. This bit must be set when the call is carried out.

2.6.1.9 Function FC13 „IB_DIAG“

The function FC13 processes the error messages of the INTERBUS together with the internal functions of the controller board. The function FC13 evaluates the bits Periphery Fail, User, Bus and Controller Error of the diagnostic status register. The data corresponding to the error are stored in the IBDB. The parameter CONFIGURATION of the function FC11 is used to determine whether error data should be stored in the IBDB and if so, which error data.

After a BUS or CTRL error, bit 2 of the standard function start register is initiated using the parameters START_UP, ACTIVATE or AUTO_START.

The START_UP parameter is set in the start-up organization block.

A button can be addressed to the ACTIVATE parameter and depending on the diagnostic status register, both parameters initiate bit 0 or 2 of the standard function start register.

Call instruction `Call FC 13`

Table 2-19 Parameters for the function FC13

Parameter	Value	Description
IBDB	DB	Global INTERBUS data block, length = 840 words
ACTIVATE	BOOL	Acknowledgement button
AUTO_START	BOOL	Automatic restart0 = only the ACTIVATE parameter can set bit 0 or 2 1 = bit 0 or 2 of the standard function start register is automatically set in the event of an error. If the error cannot be removed, bits 0 or 2 are reactivated at preset intervals (interval in DBW98 of the IBDB)
RUN	BOOL	0 = INTERBUS is in STOP state 1 = INTERBUS is in RUN state
PF	BOOL	0 = INTERBUS without peripheral fault1 = INTERBUS indicates a peripheral fault. The participant number is stored in the diagnostics parameter register.
BUS_QUALITY	BOOL	0 = High transmission quality 1 = Configured number of errors exceeded
DETECTION	BOOL	0 = No bus error 1 = Searching for bus error
BUSY_STATE	BOOL	Function active.
RET	BOOL	Result bit
START_UP	BOOL	INTERBUS start after controller startup

2.6.1.10 Function FC14 „MEM_WRITE“

The function FC14 deactivates the handshake between the controller board and the connected operating devices.

The function FC14 is called once with Mode 10 when exiting the OB1 cycle.

The bit #FC14BusyBit must already be set when the function is called up. Otherwise no action will be taken.

To set the bit #FC14BusyBit:

```
UN #FC14BusyBitS #FC14BusyBit
```

Call instruction

```
Call FC 14
```

Table 2-20 Parameters for the function FC14

Parameter	Value	Description
IN_IBDB	13	Number of the global INTERBUS data block.
IN_MODE	10	Operating mode of the controller board; here always the value 10.
IN_SOURCE_AREA	0	Data source area
IN_SOURCE_AREA_NR	0	Number of the data block if the source area = data.
IN_SOURCE_OFFSET	0	Start address in data source area.
IN_SOURCE_LENGTH	0	Number of words to be written.
IN_DESTINATION	0	Data destination
OUT_RET	#FC14RetBit	Result bit - If the bit is set, the DBW60 of the IBDB contains an error code with the following meaning:1 = "DB0" has been specified as the source in SOURCE_AREA_NR 2 = Invalid parameter specified in "SOURCE_AREA"3 = Invalid operating mode specified in "MODE" 4 = Invalid CR number specified in "DESTINATION" (number of an PCP-enabled INTERBUS participant)5 = A data set that has not been activated in IBS CMD has been specified
INOUT_BUSY	#FC14Busy Bit	Function active - is set by the user as an edge bit. This bit must be set when the call is carried out.

2.6.1.11 Function FC18 „IB_SERV“

The function FC18 sends services to the controller board and receives the response.The response is evaluated and the RETURN bit set or not set, accordingto the result of the evaluation..

Services to be sent are located in data block IN_SOURCE_NR starting from address IN_SOURCE_DW_NR.

Received responses are located in data block IN_DEST_NR starting from address IN_DEST_DW_NR.

Before you can use this function for a maximum of 126 PCP participants (CR2 to CR127) and for system management (CR0), you must make a note of the FC execution status for each CR. This is carried out by the parameter INOUT_INTERNAL which must be parameterized with the static variable "internStatFC180" for this CR. This way, only those resources needed for the number of PCP participants connected are used.

A toggle bit is used in this case so that a timer does not have to be reserved for each PCP participant. This toggle bit has a clock pulse rate in seconds, simulating a timer.

This toggle bit must be used!

Call instruction `Call FC 18`

Table 2-21 Parameters for the function FC18

Parameter	Value	Description
IN_IBDB	INT	Number of the global INTERBUS data block.
IN_SOURCE_DB_NR	INT	Number of the data block that contains the service to be sent
IN_SOURCE_DW_NR	INT	DBW start address in the transmission data block
IN_CR_NR	INT	CR number of the PCP participant (2 to 127)
IN_DEST_DB_NR	INT	Number of the data block in which the service to be received is entered
IN_DEST_DW_NR	INT	DBW start address in the receive data block
IN_TOGGLE	BOOL	Second bit (0.5 s = 0 and 0.5 s = 1)
OUT_RET	BOOL	Result bit - If the bit is set, the DBW62 of the IBDB contains an error code with the following meaning:1 = Timeout2 = Wrong confirmation code3 = Negative result6 = The variable INTERNAL was changed outside of the FC
INOUT_BUSY	BOOL	Function active - is set by the user as an edge bit.This bit must be set when the call is carried out.
INOUT_INTERNAL	INT	Internal status of function FC18.

2.6.1.12 Function FC19 „GETCONF“

The function FC19 reads service data from the controller board and copies the data to the specified destination data block of the controller.

If the related notification bit is set in the IBDB, this function retrieves the confirmation and copies it to the DEST_DB_NR starting from DEST_OFFSET.

The INOUT_BUSY bit is only reset if a valid service is received. This means that the INOUT_BUSY bit remains set until confirmation is received on the parameterized CR.

Call instruction `Call FC 19`

Table 2-22 Parameters for the function FC19

Parameter	Value	Description
IN_IBDB	INT	Number of the global INTERBUS data block.
IN_CR_NR	INT	CR number of the PCP participant (2 to 127)
IN_DEST_DB_NR	INT	Number of the data block in which the service to be received is entered
IN_DEST_OFFSET	74	DBW start address in the receive data block
OUT_RET	BOOL	Result bit - If the bit is set, the DB13.DBW58 of the IBDB contains an error code with the following meaning:1 = "DB0" has been specified as the destination in DEST_AREA_NR 2 = not used 3 = not used 4 = Invalid CR number specified in IN_CR_NR (number of an PCP-enabled INTERBUS participant)
INOUT_BUSY	BOOL	Function active - is set by the user as an edge bit.This bit must be set when the call is carried out.

2.6.1.13 Function FC78

The FC78 function decodes the MPI address which supplies the information report.

In case of a write command, FC78 writes the supplied data to the corresponding area.

In case of read command, FC78 writes the requested data to the transmission area and indicates with bit ToggleBits.FC78WriteData that data are pending transfer.

Call instruction: `Call FC 78`

Table 2-23 Parameters for the function FC78

Parameter	Value	Description
Source_DB	#QuellDb	Number of the receive data block. Contains the value of the operand "Source_DB" of FB71.
Source_Offset	#Quellen Abstand	Offset in the receive data block starting from which the information report is entered. Contains the value of the operand "Source_Offset" of FB71.
Dest_DB	#ZielDb	Number of the receive data block. Contains the value of the operand "Dest_DB" of FB71.
Dest_Offset	#ZielAbstand	Offset in the receive data block starting from which the information report is entered. Contains the value of the operand "Dest_Offset" of FB71.
InstDB	#InternDB	Number of the instance data block. Contains the value of the operand "Inst_DB" of FB71.
Schreiben	#ToggleBits.FC78WriteData	0 = Information report was received1 = Data are to be transmitted
ResetKomm	#ToggleBits.FC78Reset	Reserved
FehlerNummer	#Fehlernummer1	0 = no error occurred150 to 186 = error
FehlerNummerSubcode	#FehlerUnterNummer	Specifies the first element after which an error has occurred. This element may be located in the valid range. If this is the case, the range has been exceeded.

2.6.1.14 System Function SFC51 „RDSYSST“

The SFC51 system function determines the address ranges that are permitted or authorized in the CPU for the PABB of the inputs and outputs, flags, counters and times, and makes them available for the range check. In this process, the function supplies more information than is strictly necessary. The SFC51 system function enters the information that is not required into data block DB8 (starting from data word DW240).

The SFC51 system function is called in the FC8 function within the OB100/OB101.

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